

CLAIMS

1. A method for estimating a signal to interference-plus-noise ratio (SINR) of a wireless channel, wherein frames having a pilot portion and a non-pilot portion are transmitted over the wireless channel, said method comprising:
 - adapting an adaptive equalizer using the pilot portion of a frame;
 - applying said adaptive equalizer to the non-pilot portion of said frame, resulting in an output;
 - determining a parameter using said output; and
 - estimating the SINR of the wireless channel using said parameter.
2. The method of claim 1, wherein said non-pilot portion comprises a control portion having a plurality of control symbols, said output comprises a soft estimate of said control symbols, and said determining comprises:
 - applying a hard decision to said soft estimate, resulting in a hard estimate of said control symbols; and
 - calculating said parameter using said soft estimate and said hard estimate.
3. The method of claim 2, wherein said parameter comprises a mean squared error (MSE).
4. The method of claim 2, wherein said parameter comprises a bias.
5. The method of claim 1, wherein said non-pilot portion comprises a data portion, said method further comprising decoding said output resulting in a plurality of data bits, and wherein said determining comprises:
 - re-encoding said data bits; and

calculating said parameter using said output and said re-encoded data

6 bits.

6. The method of claim 5, wherein said parameter comprises a mean squared error (MSE).

7. The method of claim 5, wherein said parameter comprises a bias.

8. The method of claim 1, wherein said adapting results in a pilot output, said estimating results in a non-pilot SINR estimate, said parameter comprises a first parameter, and wherein said method further comprises:

- determining a second parameter using said pilot output;
- estimating the SINR of the wireless channel using said second parameter, resulting in a pilot SINR estimate;
- calculating an SINR compensation factor using said non-pilot SINR estimate and said pilot SINR estimate;
- smoothing said SINR compensation factor over a plurality of frames; and
- adjusting said pilot SINR estimate according to said smoothed SINR compensation factor.

9. The method of claim 8, wherein said smoothing comprises:

$$F(n) = \lambda F(n-1) + (1-\lambda) \frac{PilotSINR}{NonpilotSINR}$$

2 wherein F represents said smoothed SINR compensation factor, and λ represents a real positive number less than one.

10. The method of claim 8, wherein said smoothing comprises:

$$F(n) = \frac{\sum_{m=1}^M F(n-m)}{M}$$

2 wherein F represents said smoothed SINR compensation factor, and M represents the number of said plurality of frames.

11. The method of claim 1, wherein said parameter comprises a first
2 parameter, wherein said method further comprises determining a second
parameter using said output, and wherein said estimating comprises estimating
4 the SINR of the wireless channel using said first and second parameters.

12. The method of claim 11, wherein said first parameter comprises a mean
2 squared error (MSE) and said second parameter comprises a bias.

13. The method of claim 1, wherein said adapting results in a pilot output,
2 said parameter comprises a first parameter, said method further comprising
determining a second parameter using said pilot output, and said estimating
4 comprising estimating the SINR of the wireless channel using said first and
second parameters.

14. A method for estimating a signal to interference-plus-noise ratio (SINR)
2 of a wireless channel, wherein frames having a pilot portion are transmitted over
the wireless channel, said method comprising:

4 applying an adaptive equalizer to the pilot portion of a current frame,
wherein said adaptive equalizer was adapted during a previous frame, resulting
6 in an output;

determining a parameter using said output; and

- 8 estimating the SINR of the wireless channel using said parameter.
15. The method of claim 14, wherein said parameter comprises a mean
2 squared error (MSE).
16. The method of claim 14, wherein said parameter comprises a bias.
17. A method for selecting a rate for the transmission of data over a wireless
2 channel, wherein frames having a pilot portion and a non-pilot portion are
transmitted over the wireless channel, said method comprising:
4 adapting an adaptive equalizer using the pilot portion of a frame;
 applying said adaptive equalizer to the non-pilot portion of said frame,
6 resulting in an output;
 determining a parameter using said output;
8 estimating a signal to interference-plus-noise ratio (SINR) of the wireless
channel using said parameter; and
10 selecting the rate for the transmission of data using said SINR estimate.
18. The method of claim 17, wherein said parameter comprises a mean
2 squared error (MSE).
19. The method of claim 17, wherein said parameter comprises a bias.
20. An apparatus for estimating a signal to interference-plus-noise ratio
2 (SINR) of a wireless channel, wherein frames having a pilot portion and a non-
pilot portion are received via the wireless channel, said apparatus comprising:

- 4 an adaptive equalizer that is adapted using the pilot portion of a frame,
and applied to the non-pilot portion of said frame, resulting in an output;
6 means for determining a parameter using said output; and
means for estimating a SINR of the wireless channel using said
8 parameter.

21. The apparatus of claim 20, wherein said non-pilot portion comprises a
2 control portion having a plurality of control symbols, wherein the output of said
adaptive equalizer during said control portion comprises a soft estimate of said
4 control symbols, and said means for determining comprises:

- means for applying a hard decision to said soft estimate, resulting in a
6 hard estimate of said control symbols; and
means for calculating said parameter using said soft estimate and said
8 hard estimate.

22. The apparatus of claim 21, wherein said parameter comprises a mean
2 squared error (MSE).

23. The apparatus of claim 21, wherein said parameter comprises a bias.

24. The apparatus of claim 20, wherein said non-pilot portion comprises a
2 data portion having a plurality of encoded data bits, wherein the output of said
adaptive equalizer during said data portion comprises a soft estimate of said
4 encoded data bits, wherein said apparatus further comprises a channel decoder
configured to decode said soft estimate resulting in a plurality of decoded data
6 bits, and wherein said means for determining comprises:

- means for re-encoding said decoded data bits; and
8 means for calculating said parameter using said soft estimate and said
re-encoded data bits.

25. The apparatus of claim 24, wherein said parameter comprises a mean squared error (MSE).

26. The apparatus of claim 24, wherein said parameter comprises a bias.

27. The apparatus of claim 20, wherein the output of said adaptive equalizer during said pilot portion results in a pilot output, said SINR estimate comprises a non-pilot SINR estimate, said parameter comprises a first parameter, and wherein said apparatus further comprises:

- means for determining a second parameter using said pilot output;
- means for estimating the SINR of the wireless channel using said second parameter, resulting in a pilot SINR estimate;
- means for calculating an SINR compensation factor using said non-pilot SINR estimate and said pilot SINR estimate;
- means for smoothing said SINR compensation factor over a plurality of frames; and
- means for adjusting said pilot SINR estimate according to said smoothed SINR compensation factor.

28. The apparatus of claim 27, wherein said means for smoothing is

$$F(n) = \lambda F(n-1) + (1-\lambda) \frac{PilotSINR}{NonpilotSINR}$$

configured according to:

wherein F represents said smoothed SINR compensation factor, and λ represents a real positive number less than one.

29. The apparatus of claim 27, wherein said means for smoothing is

$$F(n) = \frac{\sum_{m=1}^M F(n-m)}{M}$$

2 configured according to:

wherein **F** represents said smoothed SINR compensation factor, and **M**

4 represents the number of said plurality of frames.

30. An apparatus for estimating a signal to interference-plus-noise ratio

2 (SINR) of a wireless channel, wherein said apparatus comprises a receiver that
 4 receive frames via the wireless channel, said frames having a pilot portion and a
 6 non-pilot portion, wherein said receiver includes an adaptive equalizer that is
 8 adapted using said pilot portion and applied to said non-pilot portion resulting in
 an output, wherein said receiver is configured to determine a parameter using
 said output, and wherein said receiver is further configured to estimate the SINR
 of the wireless channel using said parameter.

31. The apparatus of claim 30, wherein said non-pilot portion comprises a

2 control portion having a plurality of control symbols, wherein the output of said
 adaptive equalizer during said control portion comprises a soft estimate of said
 4 control symbols, wherein said receiver is configured to apply a hard decision to
 said soft estimate, resulting in a hard estimate of said control symbols, and
 6 wherein said receiver is further configured to calculate said parameter using
 said soft estimate and said hard estimate.

32. The apparatus of claim 31, wherein said parameter comprises a mean

2 squared error (MSE).

33. The apparatus of claim 31, wherein said parameter comprises a bias.

34. The apparatus of claim 30, wherein said non-pilot portion comprises a data portion having a plurality of encoded data bits, wherein the output of said adaptive equalizer during said data portion comprises a soft estimate of said encoded data bits, wherein said receiver further includes a channel decoder configured to decode said soft estimate resulting in a plurality of decoded data bits, wherein said receiver is configured to re-encode said decoded data bits, and wherein said receiver is further configured to calculate said parameter using said soft estimate and said re-encoded data bits.

35. The apparatus of claim 34, wherein said parameter comprises a mean squared error (MSE).

36. The apparatus of claim 34, wherein said parameter comprises a bias.

37. A wireless communication system comprising:
a wireless channel;
a transmitter to transmit frames having a pilot portion and a non-pilot portion over said wireless channel at a data rate; and
a receiver to receive said frames via said wireless channel, wherein said receiver includes:
an adaptive equalizer that is adapted using said pilot portion, and applied to said non-pilot portion resulting in an output,
means for estimating a signal to interference-plus-noise ratio (SINR) of said wireless channel using said output,
means for selecting a data rate control (DRC) value using said SINR, and

14 means for transmitting said DRC value to said transmitter via said wireless channel.